Trade reform, policy uncertainty and the current account

van Wijnbergen, S.

Publication date:
1993

Document Version
Publisher's PDF, also known as Version of record

Link to publication in Tilburg University Research Portal

Citation for published version (APA):
van Wijnbergen, S. (1993). *Trade reform, policy uncertainty and the current account: A non-expected utility approach*. (Reprint Series). CentER for Economic Research.

CentER for Economic Research

REPRINT

Trade Reform, Policy Uncertainty, and the Current Account: A Non-Expected-Utility Approach

by
Sweder van Wijnbergen

Reprinted from American Economic Review, Vol. 82, No. 3, 1992

Reprint Series
no. 109

TILBURG UNIVERSITY

Address : Warandelaan 2, P.O. Box 90153, 5000 LE Tilburg, The Netherlands
Phone : +31 13 663050
Telex : 52426 kub nl
Telefax : +31 13 663066
E-mail : "center@htikub5.bitnet"

ISSN 0924-7874

1992

CentER REPRINT
for
Economic Research

Trade Reform, Policy Uncertainty, and the Current Account: A Non-Expected-Utility Approach

by
Sweder van Wijnbergen

Reprinted from American Economic Review,
Vol. 82, No. 3, 1992

Reprint Series
no. 109

Trade Reform, Policy Uncertainty, and the Current Account: A Non-Expected-Utility Approach

By SWEDER VAN WIJNBERGEN*

Rapid and comprehensive reduction in barriers to international trade has often been followed by a sharp deterioration in the current account (Rudiger Dornbusch, 1987; Dani Rodrik, 1990).[1] The steep, $9 billion deterioration in Mexico's current account during the two years after the trade-reform process was accelerated in 1987 is only the most recent example. The macroeconomic counterpart of the deterioration has typically been a decline in private savings; no clear response pattern has been observed for private investment. Economic theory has in recent years reached clear conclusions on these matters; the problem with these conclusions is that they seem counterfactual.

The problem does not really reside with investment. The investment response will depend on relative capital intensity of the industry whose protection is removed compared to the sectors favored by trade liberalization. Putty-clay considerations would tend to strengthen the investment response, as old capital gets scrapped more quickly in response to changing relative prices. On the other hand, policy uncertainty bestows an option value on assets more liquid than physical capital (van Wijnbergen, 1985) and thus tends to depress investment. However, with no clear prediction emerging from economic theory, the ambiguous empirical record on this score is only to be expected.

The situation is different with savings. In an elegant analysis, Assaf Razin and Lars Svensson (1983) pointed out that a permanent reduction in tariffs affects current and future goods in the same way, leaving intertemporal relative prices and private savings unchanged. Gradual tariff reduction in fact raises the price of current goods in terms of future goods and would thus tend to improve private savings (Sebastian Edwards and van Wijnbergen [1986] make a case for gradualism in the presence of capital-market imperfections on this basis). It is this body of theory that, for all its theoretical elegance, seems firmly at variance with the facts.

This paper starts from the observation that anticipated policy reversal may explain a decline in private savings for the same reason gradual tariff reduction causes private savings to go up. Temporarily low tariffs lower the relative price of current goods in terms of future goods and thus tend to depress private savings.

However, the possibility of policy reversal does more than skew intertemporal relative prices toward today rather than tomorrow; it also increases policy uncertainty per se. Is it possible that this increase in uncertainty reinforces the private-savings impact of an anticipated reversal of trade reform? This cannot really be analyzed in the standard expected-utility framework because risk aversion and intertemporal substitution, two very different attributes of consumer preferences, are arbitrarily confined to be inversely related in that framework. I show that, in the context of imperfectly credible trade reform, this inverse relation implies that policy uncertainty is unimportant when it would reduce private savings and, when

*Development Research Department, World Bank, 1818 H Street, N.W., Washington DC 20433, and CEPR, 6 Duke of York Street, London SW1Y 6LA, U.K. I am indebted to Patricio Arrau and Ravi Kanbur for helpful discussions. The opinions expressed in this paper do not necessarily coincide with those of the institutions with which I am affiliated.

[1] Dornbusch (1987) makes the point in a different context: he argues that an increase in tariffs would improve the U.S. current account. By symmetry (not an innocuous assumption), this supports the view that a decrease would deteriorate the current account.

important, would tend to increase private savings.

This conclusion depends entirely on the inverse relation between risk aversion and intertemporal substitution elasticity imposed arbitrarily by the framework of expected-utility maximization. The "ordinal certainty equivalence" (OCE) approach introduced by Larry Selden (1978) offers a way out of the straitjacket imposed by expected-utility maximization. The OCE approach allows independent parametrization of risk aversion and intertemporal substitution. Within the OCE framework, I show that, with positive risk aversion, policy uncertainty will in fact reinforce the negative savings impact of an anticipated policy reversal, especially when that negative impact is strong. This suggests that with high risk aversion and high intertemporal substitution, a rapid trade reform that is not fully credible may depress private savings significantly, with attendant negative impact on the current account. This conclusion seems to accord well with actual experience.

I. The Model

There are two periods, 0 and 1. Thus, the time-consistency problems that naive applications of the OCE approach lead to in multiperiod settings (cf. Philippe Weil, 1990) do not arise. Consumers consume home and foreign goods in each period. The home good is chosen as numeraire, and the exogenous world relative price of the foreign good in terms of the home good is normalized to 1. There is no tariff in period 0; it is the beginning of a period of complete trade liberalization. However, π, the probability that the old tariff $(t_1 - 1)$ will be restored in the next period, is larger than zero. Thus, the future local price of the foreign good, T_1, follows a binomial distribution:

$$(1)\quad T_1 = \begin{cases} t_1 & \text{with probability } \pi \\ 1 & \text{with probability } 1-\pi. \end{cases}$$

To simplify the structure of income effects, assume that consumers have no within-period income, just wealth at the beginning of period 0, W_0. Wealth is spent today or tomorrow, and within each period, on home goods h and imports m. Wealth not spent in period 0 earns a certain rate of return R (the world rate of interest) between period 0 and 1.

I assume homothetic, unit-elastic preferences across goods within a time period.[2] Consumers know the within-period tariff at the beginning of the period, before allocating expenditure over home and foreign goods. One can therefore define real consumption expenditure C_1 and the associated dual price index p_1 as

$$(2)\qquad C_1 = (h_1^* + m_1^* T_1)/p_1$$
$$p_1 = T_1^{\alpha}.$$

(an asterisk indicates an optimally chosen quantity). C_0 is defined similarly. By assumption, the period-0 tariff is zero: $T_0 = 1$. The budget share of foreign goods in each period, α, is constant because of the assumption of a unitary within-period substitution elasticity. Under these assumptions, the within-period budget identities are

$$(3)\qquad W_2 = 0 \qquad pC_1 = W_1$$
$$W_1 = (W_0 - C_0)R.$$

The consumer choice problem presented here involves both intertemporal choice for given intertemporal prices and response to risk. The standard expected-utility framework is unsatisfactory for this problem, because risk aversion and intertemporal substitution, two very different attributes of consumer preferences, are necessarily inversely related in that framework. This follows from the controversial assumption, made axiomatically, of consumer indifference with respect to the timing of resolution of uncertainty about consumption lotteries (cf. Larry Epstein and Stanley Zin, 1989; Weil, 1990).

[2] The assumption of unit intratemporal elasticity is made to simplify the expression for the exact period-1 consumer price index and the consumption rate of interest. Qualitatively similar results would come out with any positive intratemporal substitution elasticity.

I use the "ordinal certainty equivalence" framework (Selden, 1978) to disentangle risk aversion and intertemporal substitution. Under this approach, utility is defined over the certain period-0 consumption level and a certainty-equivalent measure of the uncertain period-1 consumption level. This utility function is characterized by an intertemporal substitution elasticity $\sigma = 1/\rho$. The certainty equivalent of period-1 consumption is based on risk aversion parametrized by the coefficient of relative risk aversion, γ, which is assumed to be strictly positive. This results in the following welfare function:

$$(4)\quad V = \left[C_0^{1-\rho} + \beta\left(EC_1^{1-\gamma}\right)^{\frac{1-\rho}{1-\gamma}} \right]^{\frac{1}{1-\rho}}$$

$$= \left(C_0^{1-\rho} + \beta C_{1,\mathrm{RA}}^{1-\rho}\right)^{\frac{1}{1-\rho}}$$

with

$$C_{1,\mathrm{RA}} = \left[E(C_1^{1-\gamma})\right]^{\frac{1}{1-\gamma}}.$$

$C_{1,\mathrm{RA}}$ can be interpreted as the certainty equivalent of the uncertain period-1 aggregate consumption level, with γ as the relevant risk-aversion parameter. Using (2) and (3), one can derive a simplified expression for C_1:

$$(5)\quad W_0 = C_0 + \left(\frac{T_1^a}{R}\right) C_1$$

$$= C_0 + \frac{C_1}{R_{\mathrm{CRI}}} \qquad R_{\mathrm{CRI}} = \frac{R}{T_1^a}$$

$$\Rightarrow C_1 = R_{\mathrm{CRI}}(W_0 - C_0).$$

R_{CRI} is the *ex post* consumption rate of interest: the terms on which consumption today can be substituted for consumption tomorrow. Since T_1 is stochastic, R_{CRI} is stochastic too; define R_γ, the risk-adjusted consumption rate of interest, as the *ex ante* certainty equivalent of R_{CRI}:

$$(6)\quad R_\gamma = \left(ER_{\mathrm{CRI}}^{1-\gamma}\right)^{\frac{1}{1-\gamma}}.$$

Then, the certainty equivalent of C_1, $C_{1,\mathrm{RA}}$, equals

$$(7)\quad EC_1^{1-\gamma} = (W_0 - C_0)^{1-\gamma} E\left(R_{\mathrm{CRI}}^{1-\gamma}\right)$$

$$= (W_0 - C_0)^{1-\gamma} R_\gamma^{1-\gamma}.$$

Maximizing V as defined in equation (4) subject to the budget constraints (3) and using equation (7) yields the following for period-0 consumption, C_0:

$$(8)\quad C_0 = \frac{1}{1+A} W_0.$$

That is, period-0 consumption is proportional to wealth. The proportionality factor $1/(1+A)$ depends on the risk-adjusted rate of interest R_γ, the subjective time-preference discount-factor β, and the intertemporal substitution elasticity:

$$(9)\quad A = \beta^{1/\rho} R_\gamma^{(1-\rho)/\rho}.$$

Trade-policy reversal thus affects private consumption in period 0 entirely through its impact on the risk-adjusted consumption rate of interest, R_γ. An increase in this rate affects period-0 consumption:

$$(10)\quad \frac{\partial C_0}{\partial R_\gamma} = -\frac{1}{(1+A)^2}\left(\frac{A}{R_\gamma}\right)\left(\frac{1-\rho}{\rho}\right)$$

$$= \varphi(\rho - 1) \qquad \varphi > 0.$$

If the intertemporal substitution is larger than 1 ($\rho < 1$), a higher risk-adjusted consumption rate of interest depresses private consumption.

II. Trade Reform, Future Policy Reversal, and Private Savings

Since all the effects of potential policy reversals work through the risk-adjusted consumption rate of interest, I first calculate this rate for the binomial distribution over future tariff rates of equation (1):

$$(11)\quad R_\gamma = \left[E\left(\frac{R}{T_1^\alpha}\right)^{1-\gamma}\right]^{\frac{1}{1-\gamma}}$$

$$= R\left[1+\pi\left(t_1^{-\alpha(1-\gamma)}-1\right)\right]^{\frac{1}{1-\gamma}}.$$

Obviously, for $\gamma = 0$ this rate equals the expected rate:

$$(12)\quad R_{\gamma=0} = (1-\pi)R + \pi t_1^{-\alpha}R$$

$$= R\left[\pi\left(t_1^{-\alpha}-1\right)+1\right].$$

It is instructive to separate the effect of potential future tariff increases through their impact on the *expected* consumption rate of interest from their impact on savings through increasing the variance of the consumption rate of interest. I therefore examine the case of a fully anticipated trade-policy reversal first, before introducing uncertainty about it in the next subsection.

A. *Anticipated Future Trade-Policy Reversal and Private Savings*

With full anticipation ($\pi = 1$), the risk-adjusted rate of interest R_γ collapses into the expected rate for $\pi = 1$:

$$(13)\quad R_\gamma = R\left[1+\left(t_1^{-\alpha(1-\gamma)}-1\right)\right]^{\frac{1}{1-\gamma}}$$

$$= Rt_1^{-\alpha}.$$

From (13), one can derive the impact of a fully anticipated trade-policy reversal (higher future tariffs) on R_γ:

$$(14)\quad \frac{\partial R_\gamma}{\partial t_1} = -\alpha R t_1^{-(1+\alpha)}.$$

Equation (14) establishes the first point of this paper: an anticipated trade-policy reversal (i.e., an anticipation that future tariffs will exceed current tariffs) lowers the risk-adjusted consumption rate of interest. Combining (10) and (14) then indicates how an anticipated trade-liberalization reversal (higher future tariffs) affects current consumption:

$$(15)\quad \frac{\partial C_0}{\partial t_1} = \left(\frac{\partial C_0}{\partial R_\gamma}\right)\left(\frac{\partial R_\gamma}{\partial t_1}\right)$$

$$= -\varphi(\rho-1)\alpha R t_1^{-(1+\alpha)}$$

$$> 0 \quad \text{if and only if } \frac{1}{\rho} > 1.$$

Equation (15) establishes the following proposition.

PROPOSITION 1 (IT Effect): *An anticipated rollback of trade liberalization leads to an increase in current consumption (a decline in private savings) if the intertemporal substitution elasticity exceeds* 1 *($\rho < 1$).*[3]

B. *Private Savings and Uncertainty about Future Trade Policy*

Does uncertainty about future trade policy per se, for any given expected value of future tariffs,[4] have an impact on period-0 consumption? Such an effect would open up a second channel through which a trade reform with less than complete credibility could affect private savings. This could be assessed by manipulating π and t_1 so as to

[3]The impact on savings will be unconditionally negative if consumers anticipate the income effects of a period-1 rebate of tariff revenues.

[4]Or, more precisely, for any given expected value of the consumption discount rate.

increase the variance for given expected value of the future dual price index, p_1. However, the particular structure of the model is such that this approach is a difficult route toward establishing the link between trade-policy uncertainty and private savings. The first problem is that an increase in the variance of the expected consumption rate of interest that preserves the mean would imply a complicated nonlinear restriction on t_1 and π [it requires keeping expression (12) constant]. The second problem is more serious, since it is more than just a technical complication that could in principle be dealt with like the first. The problem is that the relation between the variance and π is quadratic under the binomial assumption made in equation (1) and has an interior maximum (the variance is proportional to $\pi[1-\pi]$). This relation can thus not be inverted to write R_γ as a function of the variance rather than of π itself. Different values of π can yield the same variance of the expected consumption rate of interest, so there is no way π can be substituted out of the expression for R_γ to write R_γ as a function of the variance instead. Moreover, changes in π will have effects on the variance of the expected rate of interest that differ in their sign depending on the initial value from which π is changing. I therefore follow a different approach.

In the OCE framework, assuming $\gamma = 0$ eliminates all impact of uncertainty, obviously without any impact on the *expected* consumption rate of interest. Thus, an analysis of the case for $\gamma = 0$ isolates the pure expected reversal effect, with no pollution by uncertainty per se. The impact of uncertainty can then be assessed by looking at the impact of increasing γ. Increasing γ leaves the expected consumption discount rate unaffected, since it only involves a change in preferences, not in the objective environment. It therefore does not have any effect on the impact of an *expected* reversal analysed in Subsection II-A; in the OCE approach, risk aversion and intertemporal substitution can be separated. Therefore, the impact of increasing γ from 0 is the impact of uncertainty at the value to which γ has been increased. Finally, since the only uncertainty in the model is the uncertainty related to future tariffs, the entire impact of the increase in γ is due to the existing uncertainty about future trade policy. The impact of an increase in γ would be zero if there were no tariff uncertainty.

Consider how an increase in γ would affect period-0 consumption given the stochastic structure outlined in (9). Once again, the entire impact of both uncertainty and of increases in γ runs through the impact on the risk-adjusted interest rate. Thus, consider the derivative of R_γ with respect to γ. To this end, I introduce some simplifying notation. Define first the consumption discount rate in case of a zero future tariff as R_{H}, and in the case of a positive future tariff as R_{L}. Also, define k as $k = 1-\gamma$. This yields

$$(16)\quad R_\gamma = \left[\pi R_{\mathrm{L}}^k + (1-\pi)R_{\mathrm{H}}^k\right]^{1/k} = \left(ER_i^k\right)^{1/k} \qquad i = \mathrm{L,H}.$$

E is the expectations operator over the distribution specified in equation (1). Taking logs and bringing k to the other side yields

$$(17)\qquad k\log R_\gamma = \log\left(ER_i^k\right).$$

Log-differentiation yields

$$(18)\quad \left(\frac{k}{R_\gamma}\right)\left(\frac{dR_\gamma}{dk}\right) + \log R_\gamma = \frac{E[R_i^k\log(R_i)]}{E(R_i^k)}.$$

Multiplying both sides by k and rearranging terms gives

$$(19)\quad E(R_i^k)\left(\frac{k^2}{R_\gamma}\right)\left(\frac{dR_\gamma}{dk}\right) = E[R_i^k\log(R_i^k)] - E(R_i^k)\log(ER_i^k) > 0.$$

The inequality in (19) obtains because of convexity of the function $f(z) = z\log(z)$. Since $k = 1-\gamma$, equation (19) establishes the result:[5]

$$(20)\quad dk = -d\gamma \Rightarrow \frac{dR_\gamma}{d\gamma} < 0 \quad \text{for all } \gamma.$$

Thus, introducing risk aversion in the presence of uncertainty about future trade reform will unambiguously lower the risk-adjusted consumption rate of interest, something that it would not have done without the trade-related uncertainty (since there is no other source of uncertainty). One can therefore conclude that uncertainty about future trade-policy reversal will lower the risk-adjusted consumption rate of interest. However, (10) states that a cut in the risk-adjusted rate of interest will depress private savings if the intertemporal substitution elasticity is larger than 1 ($\rho < 1$). Thus, combining equations (10) and (20) yields the following proposition.

PROPOSITION 2 (Uncertainty Effect): *Uncertainty about future trade policy per se (i.e., for given expected value of the tariff) will increase private consumption today if the intertemporal rate of substitution exceeds* 1 *($\rho < 1$).*

Thus, under the OCE approach, the intertemporal substitution effect (IS) of Proposition 1 reinforces the uncertainty effect (UE) of Proposition 2 for all values of ρ. If intertemporal substitution is high ($\rho <$ 1), both the IS effect and the UE effect increase private consumption; if intertemporal substitution is low ($\rho > 1$), both depress private consumption. Moreover, this holds for all values of the risk-aversion parameter γ. This contrasts with the expected-utility approach, in which the two effects reinforce each other only when $\gamma < 1$ (i.e., when uncertainty is relatively unimportant because risk aversion is low).

III. Conclusions

This paper starts from the observation that trade liberalization is often followed by a strong surge of imports and an accompanying current-account deterioration. The macroeconomic counterpart of this deterioration is typically a decline in savings rather than an investment boom. I show first of all that anticipation of reimposition of tariffs in the future lowers the expected consumption rate of interest (makes current goods cheaper in terms of future goods). Therefore, an anticipated future tariff increase will increase current consumption if the intertemporal substitution elasticity is larger than 1. If consumers internalize the impact of future tariff revenues on their after-tax income, the savings impact will *always* be negative, even for an intertemporal substitution elasticity below 1.

The second result concerns the impact of policy uncertainty per se on private savings. I separate the impact of *expected* shifts in intertemporal relative prices from risk aversion by using the ordinal-certainty-equivalence approach pioneered by Selden (1978), and, for infinite horizons, by Epstein and Zin (1989) and Weil (1990). This approach relaxes the rigid inverse relationship between intertemporal substitution and risk aversion that characterizes the expected-utility approach to consumer choice under uncertainty. Within the OCE framework, I establish that policy uncertainty per se will further reduce private savings if (a) there is positive risk aversion and (b) the intertemporal substitution elasticity exceeds 1.

This is an interesting result for two reasons. First it shows how policy uncertainty about future tariffs will reinforce the negative savings impact of the direct anticipated reversal effect exactly when the latter is large (intertemporal substitution elasticity is high). The two effects will thus be in the same direction exactly when they matter most. The second observation is more academic. In the standard expected-utility approach, risk aversion is low when intertemporal substitution is high, because the relevant elasticities are each other's inverse. The consequence of this is that whenever the uncertainty effect is important, the direct anticipation effect is not and vice versa. This result is reversed in the non-expected-utility approach: the two effects are comple-

[5]This result is a special case of a general proposition in Peter Diamond and Joseph Stiglitz (1974).

mentary in the case where the direct anticipation effect is important.

How relevant is all this from an empirical point of view? There is after all a widely held belief that the intertemporal substitution elasticity is very low (ρ very high), with some economists setting ρ as high as around 10 (Robert Hall, 1988). More recent evidence using the approach of Epstein and Zin (1989) to consumer choice under uncertainty has tended to come up with different results, however. Most relevant in this case are the results reported for Mexico in Patricio Arrau and van Wijnbergen (1991) and Gil Bufman et al. (1991), since Mexico's experience with trade reform was in fact what triggered this paper.

Arrau and van Wijnbergen (1991) and Bufman et al. (1991) find values for ρ between 0.24 and 0.8, depending on whether or not money services are accounted for in the measure of consumption, indicating a substitution elasticity well in excess of 1. With money services incorporated, the implicit estimate of the intertemporal substitution elasticity is 4.2, significantly in excess of 1. Similar results are reported by Epstein and Zin (1991) for the United States. Whether the channels explored in this paper were in fact behind the sharp deterioration in the trade balance that followed Mexico's trade reforms requires a more in-depth analysis than the evidence just mentioned, but the empirical results suggest that the channels explored in this paper could conceivably have played an important role.

These results have important policy implications. If the trade reform will not be reversed, but the government cannot credibly communicate that to the private sector, consumers effectively trade off the wrong intertemporal prices. As a consequence, private savings will be suboptimally low; this justifies policy intervention to increase private savings. This is a special case of a more general point made by Guillermo A. Calvo and Carlos A. Vegh (1990): mistaken beliefs about future policy act like a distortion and therefore justify policy intervention in principle. Increasing private savings should preferably be done through a temporary increase in consumption taxes. If that is not feasible, a case can be made for temporary tariffs as a second-best response; this would be equivalent to gradual rather than "cold turkey" trade liberalization.

A magnifying impact could come about if the private-savings response leads to such a large current-account deficit that the trade reform itself does in fact get reversed, a case of self-fulfilling prophecy.[6] This very real possibility further strengthens the case for policy intervention to increase private savings and, arguably, for external support in the early periods of trade reform, possibly through institutions like the World Bank.

REFERENCES

Arrau, Patricio and van Wijnbergen, Sweder, "Intertemporal Substitution, Risk Aversion, and Private Savings in Mexico," mimeo, World Bank, 1991.

Bufman, Gil, Leiderman, Leo and van Wijnbergen, Sweder, "Consumption and Velocity during Stabilization Programs," mimeo, World Bank, 1991.

Calvo, A. Guillermo and Vegh, Carlos A., "Credibility and the Dynamics of Stabilization Policy: A Basic Framework," unpublished paper presented at the conference "Spain and the European Monetary System" (Sixth World Congress of the Econometric Society), Barcelona, August 1990.

Diamond, Peter and Stiglitz, Joseph, "Increases in Risk and Risk Aversion," *Journal of Economic Theory*, July 1974, *8*, 337–60.

Dornbusch, Rudiger, "External Balance Correction: Depreciation or Correction?" *Brookings Papers on Economic Activity*, 1987, (1), 249–71.

______, "Credibility and Stabilization," mimeo, Massachusetts Institute of Technology, 1989.

Edwards, Sebastian and van Wijnbergen, Sweder, "The Welfare Effects of Trade and Capital Market Liberalization," *International Economic Review*, February 1986, *27*,

[6] Dornbusch (1989) discusses the possibility of such self-fulfilling equilibria in the context of stabilization programs.

141–9.

Epstein, Larry and Zin, Stanley, "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: A Theoretical Framework," *Econometrica*, July 1989, *57*, 937–69.

_____ and _____, "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis," *Journal of Political Economy*, April 1991, *99*, 263–86.

Hall, Robert, "Intertemporal Substitution in Consumption," *Journal of Political Economy*, April 1988, *96*, 339–57.

Razin, Assaf and Svensson, Lars, "Trade Taxes and the Current Account," *Economics Letters*, 1983, *13* (1), 55–7.

Rodrik, Dani, "Trade Policies and Development: Some New Issues," mimeo, Kennedy School of Government, Harvard University, 1990.

Selden, Larry, "A New Representation of Preferences over 'Certain × Uncertain' Consumption Pairs: The 'Ordinal Certainty Equivalence' Hypothesis," *Econometrica*, September 1978, *46*, 1025–45.

van Wijnbergen, Sweder, "Trade Reform, Aggregate Investment, and Capital Flight: On Credibility and the Value of Information," *Economics Letters*, 1985, *19* (4), 369–72.

Weil, Philippe, "Non-Expected Utility in Macroeconomics," *Quarterly Journal of Economics*, February 1990, *105*, 29–43.

Reprint Series, CentER, Tilburg University, The Netherlands:

No. 1 G. Marini and F. van der Ploeg, Monetary and fiscal policy in an optimising model with capital accumulation and finite lives, *The Economic Journal*, vol. 98, no. 392, 1988, pp. 772 - 786.

No. 2 F. van der Ploeg, International policy coordination in interdependent monetary economies, *Journal of International Economics*, vol. 25, 1988, pp. 1 - 23.

No. 3 A.P. Barten, The history of Dutch macroeconomic modelling (1936-1986), in W. Driehuis, M.M.G. Fase and H. den Hartog (eds.), *Challenges for Macroeconomic Modelling*, Contributions to Economic Analysis 178, Amsterdam: North-Holland, 1988, pp. 39 - 88.

No. 4 F. van der Ploeg, Disposable income, unemployment, inflation and state spending in a dynamic political-economic model, *Public Choice*, vol. 60, 1989, pp. 211 - 239.

No. 5 Th. ten Raa and F. van der Ploeg, A statistical approach to the problem of negatives in input-output analysis, *Economic Modelling*, vol. 6, no. 1, 1989, pp. 2 - 19.

No. 6 E. van Damme, Renegotiation-proof equilibria in repeated prisoners' dilemma, *Journal of Economic Theory*, vol. 47, no. 1, 1989, pp. 206 - 217.

No. 7 C. Mulder and F. van der Ploeg, Trade unions, investment and employment in a small open economy: a Dutch perspective, in J. Muysken and C. de Neubourg (eds.), *Unemployment in Europe*, London: The Macmillan Press Ltd, 1989, pp. 200 - 229.

No. 8 Th. van de Klundert and F. van der Ploeg, Wage rigidity and capital mobility in an optimizing model of a small open economy, *De Economist*, vol. 137, nr. 1, 1989, pp. 47 - 75.

No. 9 G. Dhaene and A.P. Barten, When it all began: the 1936 Tinbergen model revisited, *Economic Modelling*, vol. 6, no. 2, 1989, pp. 203 - 219.

No. 10 F. van der Ploeg and A.J. de Zeeuw, Conflict over arms accumulation in market and command economies, in F. van der Ploeg and A.J. de Zeeuw (eds.), *Dynamic Policy Games in Economics*, Contributions to Economic Analysis 181, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1989, pp. 91 - 119.

No. 11 J. Driffill, Macroeconomic policy games with incomplete information: some extensions, in F. van der Ploeg and A.J. de Zeeuw (eds.), *Dynamic Policy Games in Economics*, Contributions to Economic Analysis 181, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1989, pp. 289 - 322.

No. 12 F. van der Ploeg, Towards monetary integration in Europe, in P. De Grauwe et al., *De Europese Monetaire Integratie: vier visies*, Wetenschappelijke Raad voor het Regeringsbeleid V 66, 's-Gravenhage: SDU uitgeverij, 1989, pp. 81 - 106.

No. 13 R.J.M. Alessie and A. Kapteyn, Consumption, savings and demography, in A. Wenig, K.F. Zimmermann (eds.), *Demographic Change and Economic Development*, Berlin/Heidelberg: Springer-Verlag, 1989, pp. 272 - 305.

No. 14 A. Hoque, J.R. Magnus and B. Pesaran, The exact multi-period mean-square forecast error for the first-order autoregressive model, *Journal of Econometrics*, vol. 39, no. 3, 1988, pp. 327 - 346.

No. 15 R. Alessie, A. Kapteyn and B. Melenberg, The effects of liquidity constraints on consumption: estimation from household panel data, *European Economic Review*, vol. 33, no. 2/3, 1989, pp. 547 - 555.

No. 16 A. Holly and J.R. Magnus, A note on instrumental variables and maximum likelihood estimation procedures, *Annales d'Économie et de Statistique*, no. 10, April-June, 1988, pp. 121 - 138.

No. 17 P. ten Hacken, A. Kapteyn and I. Woittiez, Unemployment benefits and the labor market, a micro/macro approach, in B.A. Gustafsson and N. Anders Klevmarken (eds.), *The Political Economy of Social Security*, Contributions to Economic Analysis 179, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1989, pp. 143 - 164.

No. 18 T. Wansbeek and A. Kapteyn, Estimation of the error-components model with incomplete panels, *Journal of Econometrics*, vol. 41, no. 3, 1989, pp. 341 - 361.

No. 19 A. Kapteyn, P. Kooreman and R. Willemse, Some methodological issues in the implementation of subjective poverty definitions, *The Journal of Human Resources*, vol. 23, no. 2, 1988, pp. 222 - 242.

No. 20 Th. van de Klundert and F. van der Ploeg, Fiscal policy and finite lives in interdependent economies with real and nominal wage rigidity, *Oxford Economic Papers*, vol. 41, no. 3, 1989, pp. 459 - 489.

No. 21 J.R. Magnus and B. Pesaran, The exact multi-period mean-square forecast error for the first-order autoregressive model with an intercept, *Journal of Econometrics*, vol. 42, no. 2, 1989, pp. 157 - 179.

No. 22 F. van der Ploeg, Two essays on political economy: (i) The political economy of overvaluation, *The Economic Journal*, vol. 99, no. 397, 1989, pp. 850 - 855; (ii) Election outcomes and the stockmarket, *European Journal of Political Economy*, vol. 5, no. 1, 1989, pp. 21 - 30.

No. 23 J.R. Magnus and A.D. Woodland, On the maximum likelihood estimation of multivariate regression models containing serially correlated error components, *International Economic Review*, vol. 29, no. 4, 1988, pp. 707 - 725.

No. 24 A.J.J. Talman and Y. Yamamoto, A simplicial algorithm for stationary point problems on polytopes, *Mathematics of Operations Research*, vol. 14, no. 3, 1989, pp. 383 - 399.

No. 25 E. van Damme, Stable equilibria and forward induction, *Journal of Economic Theory*, vol. 48, no. 2, 1989, pp. 476 - 496.

No. 26 A.P. Barten and L.J. Bettendorf, Price formation of fish: An application of an inverse demand system, *European Economic Review*, vol. 33, no. 8, 1989, pp. 1509 - 1525.

No. 27 G. Noldeke and E. van Damme, Signalling in a dynamic labour market, *Review of Economic Studies*, vol. 57 (1), no. 189, 1990, pp. 1 - 23.

No. 28 P. Kop Jansen and Th. ten Raa, The choice of model in the construction of input-output coefficients matrices, *International Economic Review*, vol. 31, no. 1, 1990, pp. 213 - 227.

No. 29 F. van der Ploeg and A.J. de Zeeuw, Perfect equilibrium in a model of competitive arms accumulation, *International Economic Review*, vol. 31, no. 1, 1990, pp. 131 - 146.

No. 30 J.R. Magnus and A.D. Woodland, Separability and aggregation, *Economica*, vol. 57, no. 226, 1990, pp. 239 - 247.

No. 31 F. van der Ploeg, International interdependence and policy coordination in economies with real and nominal wage rigidity, *Greek Economic Review*, vol. 10, no. 1, June 1988, pp. 1 - 48.

No. 32 E. van Damme, Signaling and forward induction in a market entry context, *Operations Research Proceedings 1989*, Berlin-Heidelberg: Springer-Verlag, 1990, pp. 45 - 59.

No. 33 A.P. Barten, Toward a levels version of the Rotterdam and related demand systems, *Contributions to Operations Research and Economics*, Cambridge: MIT Press, 1989, pp. 441 - 465.

No. 34 F. van der Ploeg, International coordination of monetary policies under alternative exchange-rate regimes, in F. van der Ploeg (ed.), *Advanced Lectures in Quantitative Economics*, London-Orlando: Academic Press Ltd., 1990, pp. 91 - 121.

No. 35 Th. van de Klundert, On socioeconomic causes of 'wait unemployment', *European Economic Review*, vol. 34, no. 5, 1990, pp. 1011 - 1022.

No. 36 R.J.M. Alessie, A. Kapteyn, J.B. van Lochem and T.J. Wansbeek, Individual effects in utility consistent models of demand, in J. Hartog, G. Ridder and J. Theeuwes (eds.), *Panel Data and Labor Market Studies*, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1990, pp. 253 - 278.

No. 37 F. van der Ploeg, Capital accumulation, inflation and long-run conflict in international objectives, *Oxford Economic Papers*, vol. 42, no. 3, 1990, pp. 501 - 525.

No. 38 Th. Nijman and F. Palm, Parameter identification in ARMA Processes in the presence of regular but incomplete sampling, *Journal of Time Series Analysis*, vol. 11, no. 3, 1990, pp. 239 - 248.

No. 39 Th. van de Klundert, Wage differentials and employment in a two-sector model with a dual labour market, *Metroeconomica*, vol. 40, no. 3, 1989, pp. 235 - 256.

No. 40 Th. Nijman and M.F.J. Steel, Exclusion restrictions in instrumental variables equations, *Econometric Reviews*, vol. 9, no. 1, 1990, pp. 37 - 55.

No. 41 A. van Soest, I. Woittiez and A. Kapteyn, Labor supply, income taxes, and hours restrictions in the Netherlands, *Journal of Human Resources*, vol. 25, no. 3, 1990, pp. 517 - 558.

No. 42 Th.C.M.J. van de Klundert and A.B.T.M. van Schaik, Unemployment persistence and loss of productive capacity: a Keynesian approach, *Journal of Macroeconomics*, vol. 12, no. 3, 1990, pp. 363 - 380.

No. 43 Th. Nijman and M. Verbeek, Estimation of time-dependent parameters in linear models using cross-sections, panels, or both, *Journal of Econometrics*, vol. 46, no. 3, 1990, pp. 333 - 346.

No. 44 E. van Damme, R. Selten and E. Winter, Alternating bid bargaining with a smallest money unit, *Games and Economic Behavior*, vol. 2, no. 2, 1990, pp. 188 - 201.

No. 45 C. Dang, The D_1-triangulation of $\mathbf{R}^n$ for simplicial algorithms for computing solutions of nonlinear equations, *Mathematics of Operations Research*, vol. 16, no. 1, 1991, pp. 148 - 161.

No. 46 Th. Nijman and F. Palm, Predictive accuracy gain from disaggregate sampling in ARIMA models, *Journal of Business & Economic Statistics*, vol. 8, no. 4, 1990, pp. 405 - 415.

No. 47 J.R. Magnus, On certain moments relating to ratios of quadratic forms in normal variables: further results, *Sankhya: The Indian Journal of Statistics*, vol. 52, series B, part. 1, 1990, pp. 1 - 13.

No. 48 M.F.J. Steel, A Bayesian analysis of simultaneous equation models by combining recursive analytical and numerical approaches, *Journal of Econometrics*, vol. 48, no. 1/2, 1991, pp. 83 - 117.

No. 49 F. van der Ploeg and C. Withagen, Pollution control and the ramsey problem, *Environmental and Resource Economics*, vol. 1, no. 2, 1991, pp. 215 - 236.

No. 50 F. van der Ploeg, Money and capital in interdependent economies with overlapping generations, *Economica*, vol. 58, no. 230, 1991, pp. 233 - 256.

No. 51 A. Kapteyn and A. de Zeeuw, Changing incentives for economic research in the Netherlands, *European Economic Review*, vol. 35, no. 2/3, 1991, pp. 603 - 611.

No. 52 C.G. de Vries, On the relation between GARCH and stable processes, *Journal of Econometrics*, vol. 48, no. 3, 1991, pp. 313 - 324.

No. 53 R. Alessie and A. Kapteyn, Habit formation, interdependent preferences and demographic effects in the almost ideal demand system, *The Economic Journal*, vol. 101, no. 406, 1991, pp. 404 - 419.

No. 54 W. van Groenendaal and A. de Zeeuw, Control, coordination and conflict on international commodity markets, *Economic Modelling*, vol. 8, no. 1, 1991, pp. 90 - 101.

No. 55 F. van der Ploeg and A.J. Markink, Dynamic policy in linear models with rational expectations of future events: A computer package, *Computer Science in Economics and Management*, vol. 4, no. 3, 1991, pp. 175 - 199.

No. 56 H.A. Keuzenkamp and F. van der Ploeg, Savings, investment, government finance, and the current account: The Dutch experience, in G. Alogoskoufis, L. Papademos and R. Portes (eds.), *External Constraints on Macroeconomic Policy: The European Experience*, Cambridge: Cambridge University Press, 1991, pp. 219 - 263.

No. 57 Th. Nijman, M. Verbeek and A. van Soest, The efficiency of rotating-panel designs in an analysis-of-variance model, *Journal of Econometrics*, vol. 49, no. 3, 1991, pp. 373 - 399.

No. 58 M.F.J. Steel and J.-F. Richard, Bayesian multivariate exogeneity analysis - an application to a UK money demand equation, *Journal of Econometrics*, vol. 49, no. 1/2, 1991, pp. 239 - 274.

No. 59 Th. Nijman and F. Palm, Generalized least squares estimation of linear models containing rational future expectations, *International Economic Review*, vol. 32, no. 2, 1991, pp. 383 - 389.

No. 60 E. van Damme, Equilibrium selection in 2 x 2 games, *Revista Espanola de Economia*, vol. 8, no. 1, 1991, pp. 37 - 52.

No. 61 E. Bennett and E. van Damme, Demand commitment bargaining: the case of apex games, in R. Selten (ed.), *Game Equilibrium Models III - Strategic Bargaining*, Berlin: Springer-Verlag, 1991, pp. 118 - 140.

No. 62 W. Güth and E. van Damme, Gorby games - a game theoretic analysis of disarmament campaigns and the defense efficiency - hypothesis -, in R. Avenhaus, H. Karkar and M. Rudnianski (eds.), *Defense Decision Making - Analytical Support and Crisis Management*, Berlin: Springer-Verlag, 1991, pp. 215 - 240.

No. 63 A. Roell, Dual-capacity trading and the quality of the market, *Journal of Financial Intermediation*, vol. 1, no. 2, 1990, pp. 105 - 124.

No. 64 Y. Dai, G. van der Laan, A.J.J. Talman and Y. Yamamoto, A simplicial algorithm for the nonlinear stationary point problem on an unbounded polyhedron, *Siam Journal of Optimization*, vol. 1, no. 2, 1991, pp. 151 - 165.

No. 65 M. McAleer and C.R. McKenzie, Keynesian and new classical models of unemployment revisited, *The Economic Journal*, vol. 101, no. 406, 1991, pp. 359 - 381.

No. 66 A.J.J. Talman, General equilibrium programming, *Nieuw Archief voor Wiskunde*, vol. 8, no. 3, 1990, pp. 387 - 397.

No. 67 J.R. Magnus and B. Pesaran, The bias of forecasts from a first-order autoregression, *Econometric Theory*, vol. 7, no. 2, 1991, pp. 222 - 235.

No. 68 F. van der Ploeg, Macroeconomic policy coordination issues during the various phases of economic and monetary integration in Europe, *European Economy - The Economics of EMU*, Commission of the European Communities, special edition no. 1, 1991, pp. 136 - 164.

No. 69 H. Keuzenkamp, A precursor to Muth: Tinbergen's 1932 model of rational expectations, *The Economic Journal*, vol. 101, no. 408, 1991, pp. 1245 - 1253.

No. 70 L. Zou, The target-incentive system vs. the price-incentive system under adverse selection and the ratchet effect, *Journal of Public Economics*, vol. 46, no. 1, 1991, pp. 51 - 89.

No. 71 E. Bomhoff, Between price reform and privatization: Eastern Europe in transition, *Finanzmarkt und Portfolio Management*, vol. 5, no. 3, 1991, pp. 241 - 251.

No. 72 E. Bomhoff, Stability of velocity in the major industrial countries: a Kalman filter approach, *International Monetary Fund Staff Papers*, vol. 38, no. 3, 1991, pp. 626 - 642.

No. 73 E. Bomhoff, Currency convertibility: when and how? A contribution to the Bulgarian debate, *Kredit und Kapital*, vol. 24, no. 3, 1991, pp. 412 - 431.

No. 74 H. Keuzenkamp and F. van der Ploeg, Perceived constraints for Dutch unemployment policy, in C. de Neubourg (ed.), *The Art of Full Employment - Unemployment Policy in Open Economies*, Contributions to Economic Analysis 203, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1991, pp. 7 - 37.

No. 75 H. Peters and E. van Damme, Characterizing the Nash and Raiffa bargaining solutions by disagreement point axions, *Mathematics of Operations Research*, vol. 16, no. 3, 1991, pp. 447 - 461.

No. 76 P.J. Deschamps, On the estimated variances of regression coefficients in misspecified error components models, *Econometric Theory*, vol. 7, no. 3, 1991, pp. 369 - 384.

No. 77 A. de Zeeuw, Note on 'Nash and Stackelberg solutions in a differential game model of capitalism', *Journal of Economic Dynamics and Control*, vol. 16, no. 1, 1992, pp. 139 - 145.

No. 78 J.R. Magnus, On the fundamental bordered matrix of linear estimation, in F. van der Ploeg (ed.), *Advanced Lectures in Quantitative Economics*, London-Orlando: Academic Press Ltd., 1990, pp. 583 - 604.

No. 79 F. van der Ploeg and A. de Zeeuw, A differential game of international pollution control, *Systems and Control Letters*, vol. 17, no. 6, 1991, pp. 409 - 414.

No. 80 Th. Nijman and M. Verbeek, The optimal choice of controls and pre-experimental observations, *Journal of Econometrics*, vol. 51, no. 1/2, 1992, pp. 183 - 189.

No. 81 M. Verbeek and Th. Nijman, Can cohort data be treated as genuine panel data?, *Empirical Economics*, vol. 17, no. 1, 1992, pp. 9 - 23.

No. 82 E. van Damme and W. Güth, Equilibrium selection in the Spence signaling game, in R. Selten (ed.), *Game Equilibrium Models II - Methods, Morals, and Markets*, Berlin: Springer-Verlag, 1991, pp. 263 - 288.

No. 83 R.P. Gilles and P.H.M. Ruys, Characterization of economic agents in arbitrary communication structures, *Nieuw Archief voor Wiskunde*, vol. 8, no. 3, 1990, pp. 325 - 345.

No. 84 A. de Zeeuw and F. van der Ploeg, Difference games and policy evaluation: a conceptual framework, *Oxford Economic Papers*, vol. 43, no. 4, 1991, pp. 612 - 636.

No. 85 E. van Damme, Fair division under asymmetric information, in R. Selten (ed.), *Rational Interaction - Essays in Honor of John C. Harsanyi*, Berlin/Heidelberg: Springer-Verlag, 1992, pp. 121 - 144.

No. 86 F. de Jong, A. Kemna and T. Kloek, A contribution to event study methodology with an application to the Dutch stock market, *Journal of Banking and Finance*, vol. 16, no. 1, 1992, pp. 11 - 36.

No. 87 A.P. Barten, The estimation of mixed demand systems, in R. Bewley and T. Van Hoa (eds.), *Contributions to Consumer Demand and Econometrics, Essays in Honour of Henri Theil*, Basingstoke: The Macmillan Press Ltd., 1992, pp. 31 - 57.

No. 88 T. Wansbeek and A. Kapteyn, Simple estimators for dynamic panel data models with errors in variables, in R. Bewley and T. Van Hoa (eds.), *Contributions to Consumer Demand and Econometrics, Essays in Honour of Henri Theil*, Basingstoke: The Macmillan Press Ltd., 1992, pp. 238 - 251.

No. 89 S. Chib, J. Osiewalski and M. Steel, Posterior inference on the degrees of freedom parameter in multivariate-*t* regression models, *Economics Letters*, vol. 37, no. 4, 1991, pp. 391 - 397.

No. 90 H. Peters and P. Wakker, Independence of irrelevant alternatives and revealed group preferences, *Econometrica*, vol. 59, no. 6, 1991, pp. 1787 - 1801.

No. 91 G. Alogoskoufis and F. van der Ploeg, On budgetary policies, growth, and external deficits in an interdependent world, *Journal of the Japanese and International Economies*, vol. 5, no. 4, 1991, pp. 305 - 324.

No. 92 R.P. Gilles, G. Owen and R. van den Brink, Games with permission structures: The conjunctive approach, *International Journal of Game Theory*, vol. 20, no. 3, 1992, pp. 277 - 293.

No. 93 J.A.M. Potters, I.J. Curiel and S.H. Tijs, Traveling salesman games, *Mathematical Programming*, vol. 53, no. 2, 1992, pp. 199 - 211.

No. 94 A.P. Jurg, M.J.M. Jansen, J.A.M. Potters and S.H. Tijs, A symmetrization for finite two-person games, *Zeitschrift für Operations Research - Methods and Models of Operations Research*, vol. 36, no. 2, 1992, pp. 111 - 123.

No. 95 A. van den Nouweland, P. Borm and S. Tijs, Allocation rules for hypergraph communication situations, *International Journal of Game Theory*, vol. 20, no. 3, 1992, pp. 255 - 268.

No. 96 E.J. Bomhoff, Monetary reform in Eastern Europe, *European Economic Review*, vol. 36, no. 2/3, 1992, pp. 454 - 458.

No. 97 F. van der Ploeg and A. de Zeeuw, International aspects of pollution control, *Environmental and Resource Economics*, vol. 2, no. 2, 1992, pp. 117 - 139.

No. 98 P.E.M. Borm and S.H. Tijs, Strategic claim games corresponding to an NTU-game, *Games and Economic Behavior*, vol. 4, no. 1, 1992, pp. 58 - 71.

No. 99 A. van Soest and P. Kooreman, Coherency of the indirect translog demand system with binding nonnegativity constraints, *Journal of Econometrics*, vol. 44, no. 3, 1990, pp. 391 - 400.

No. 100 Th. ten Raa and E.N. Wolff, Secondary products and the measurement of productivity growth, *Regional Science and Urban Economics*, vol. 21, no. 4, 1991, pp. 581 - 615.

No. 101 P. Kooreman and A. Kapteyn, On the empirical implementation of some game theoretic models of household labor supply, *The Journal of Human Resources*, vol. 25, no. 4, 1990, pp. 584 - 598.

No. 102 H. Bester, Bertrand equilibrium in a differentiated duopoly, *International Economic Review*, vol. 33, no. 2, 1992, pp. 433 - 448.

No. 103 J.A.M. Potters and S.H. Tijs, The nucleolus of a matrix game and other nucleoli, *Mathematics of Operations Research*, vol. 17, no. 1, 1992, pp. 164 - 174.

No. 104 A. Kapteyn, P. Kooreman and A. van Soest, Quantity rationing and concavity in a flexible household labor supply model, *Review of Economics and Statistics*, vol. 72, no. 1, 1990, pp. 55 - 62.

No. 105 A. Kapteyn and P. Kooreman, Household labor supply: What kind of data can tell us how many decision makers there are?, *European Economic Review*, vol. 36, no. 2/3, 1992, pp. 365 - 371.

No. 106 Th. van de Klundert and S. Smulders, Reconstructing growth theory: A survey, *De Economist*, vol. 140, no. 2, 1992, pp. 177 - 203.

No. 107 N. Rankin, Imperfect competition, expectations and the multiple effects of monetary growth, *The Economic Journal*, vol. 102, no. 413, 1992, pp. 743 - 753.

No. 108 J. Greenberg, On the sensitivity of von Neumann and Morgenstern abstract stable sets: The stable and the individual stable bargaining set, *International Journal of Game Theory*, vol. 21, no. 1, 1992, pp. 41 - 55.

No. 109 S. van Wijnbergen, Trade reform, policy uncertainty, and the current account: A non-expected-utility approach, *American Economic Review*, vol. 82, no. 3, 1992, pp. 626 - 633.

P.O. BOX 90153, 5000 LE TILBURG, THE NETHERLANDS